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# LYMPHOCYSTIS DISEASE OF FISH

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## INTRODUCTION

Viruses are submicroscopic parasites. They have not been cultivated on non-living media, and they usually freely pass through filters which retain most bacteria. They are often specific in their host, and in some instances they have high specificity for certain tissues. Some viruses destroy the host tissue; others cause it to proliferate abnormally. Lymphocystis is a virus-caused disease of fish and is unique in several ways. It is a chronic disease and is seldom if ever fatal. Host cells which become infected are stimulated to abnormal growth. Their increase in size is probably the greatest of any virus-stimulated growth. Lymphocystis is easily transmitted between species, but not easily between genera. This specificity, the chronic nature, and lack of mortality appear to be features of host/parasite relationships of very long standing.

## IDENTIFICATION

The external lesions of lymphocystis are raised growths of smooth or more commonly granular, wart-like or nodular tissue which is composed of several to many greatly enlarged host cells and their covering membrane. Infected cells often have diameters of several millimeters. The lesion is neatly described as having a raspberry texture. Individual lesions, especially early stages, may be barely visible, but they enlarge with development, and in advanced cases in some fishes the entire surface may be involved. Among Centrarchids lymphocystis is usually limited to the fins. The caudal fin is commonly the principal site of infection. Color of the lesion varies with the species of fish. It is similar to the color of fish skeletal muscle, and has been described as white, grey or yellowish. There is a tendency towards opalescence and hemorrhagic areas may be present. Lesions may occur internally as well as externally. Lymphocystis has been incorrectly identified as an infestation by copepods, as sporozoan parasites and as eggs of the helminth parasites. Careful examination under low magnification (hand lens or dissecting microscope) will often reveal great size differences between cells. This lack of uniformity will help distinguish the lesion from the more uniformly sized copepods or eggs.

## CAUSE OF THE DISEASE

It is well established that a virus causes the disease.

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## SOURCE AND RESERVOIR OF INFECTION

In all probability the disease is maintained in susceptible host fishes. Viruses are released when mature infected cells burst. Healthy fish have been experimentally infected by exposing them to water which contained emulsified lymphocystis cells.

## MODE OF TRANSMISSION

Infected host cells are stimulated to abnormal growth, and the cytoplasmic inclusion enlarges with time. Host cells ultimately burst and/or slough and virus particles are released. This can occur intermittently through the duration of infection, or it can be massive as upon death (other causes) and decomposition of the host fish.

## INCUBATION PERIOD

Under experimental conditions incubation period has varied somewhat with the species. In European perch (Acerina cernua) the minimum time for lesion development was 9 days. In Stizostedion the minimum period was about two weeks, and in Centrarchids about three weeks.

## PERIOD OF COMMUNICABILITY

Within limitations imposed by season or temperature, host specificity and the like, lymphocystis is communicable while lesions are present.

## SUSCEPTIBILITY AND RESISTANCE

Many species of marine and fresh-water fishes are susceptible. Among the artificially propagated fresh-water species (excluding exotics and aquarium fishes) the walleye and many of the Centrarchids are susceptible. As yet the disease has not been reported among salmonids. Host specificity is strong but not absolute. It has not been possible to infect Lepomis with material from Stizostedion. Weissenberg's early attempts were unsuccessful and only more recently he has been able to infect Fundulus with material from Stizostedion. The percentage of success was low and the results were atypical. Between members of the genus Lepomis the disease could be readily transmitted. Among susceptible species reinfection is possible.

## RANGE

Lymphocystis has been reported from Europe, South America and North America. Its presence in Pacific waters of North America suggests a possibility that it will be shown to occur throughout the world.

## OCCURRENCE

It is difficult to generalize on available information about occurrences of lymphocystis. Weissenberg reports peak occurrences both in winter and in summer but states that among Centrarchids winter seems to be the season of greatest prevalence. Nigrelli states that among fresh-water species the disease is more common in summer and that it disappears in fall and winter. Weissenberg states that he was not able to maintain experimental infections through a year: Nigrelli states that lesions may persist for a year or more, and Watson states three years.

## METHODS OF CONTROL

Weissenberg recommends that all tumor bearing fish be removed from the waters in which they occur and be destroyed. If high percentages of artificially propagated Centrarchids are found to carry the disease it may be possible to eliminate it by using only brood stock which are free of the disease, and by using water from a supply known to be free of tumor bearing fish. No method of treatment is known.

## ANNOTATED BIBLIOGRAPHY

Literature on lymphocystis disease is extensive. For additional references the interested reader or researcher is referred to bibliographies included in Weissenberg's publications.


Alexandrowicz, J.S.

1951. Lymphocystis tumors in the red mullet (Mullus surmuletus L.). Jour. Mar. Biol. Assoc., U.K., Vol. 30, No. 2, pp. 315-332, illus.

Report of lymphocystis in a new species. Detailed histological findings are presented. Four plates of excellent photomicrographs are appended.

* Davis, H.S.

1953. Culture and Diseases of Game Fishes. U. of Calif. Press, Berkeley and Los Angeles, 332 pp., illus.

(pp. 293) The author gives a short description of the disease and several facts regarding its occurrence; an illustration is included.

* Nigrelli, Ross F.

1954. Tumors and other atypical cell growths in temperate fresh-water fishes of North America. (Symposium. Research on Fish Diseases: A review of progress during the past 10 years), Trans. Am. Fish. Soc., Vol. 83 (for 1953), pp. 262-296, illus.

(pp. 277-279) Macroscopic and especially microscopic characters of lymphocystis disease are included. A list of susceptible fish is given. Facts of its cause, course, and occurrence are briefly discussed. A good illustration is given.

* Snieszko, S.F.

1953. Virus Diseases in Fishes: Outlook for their treatment and prevention. Prog. Fish-Cult., Vol. 15, No. 2, pp. 72-74.

The nature, biology and challenge of viruses as causes of disease are discussed. Problems which fish viruses present in research and fish culture are indicated. Recommendations are made for control of virus caused diseases.

* Watson, Stanley W.

1954. Virus Diseases of Fish (Symposium. Research on Fish Diseases: A review of progress during the past 10 years). Trans. Am. Fish. Soc., Vol. 83, pp. 331-341.

(pp. 332-333 and 338) The history, hosts, description and cause of lymphocystis disease are briefly reviewed.

Weissenberg, Richard

1939. Studies on virus diseases of fish. III. Morphological and experimental observations on the lymphocystis disease of the pike perch, Stizostedion vitreum. Zoologica, N.Y. Zoo. Soc., Vol. 24 (Part 2), pp. 245-253, illus.

Experimental transmission of lymphocystis was achieved by feeding. Growth stages of affected cells are described; the author states that the disease is similar to lymphocystis in European perch. Previous literature is reviewed, and a section on control is included. Microscopic anatomy of lymphocystis cells is illustrated.

1945. Studies on virus diseases of fish. IV. Lymphocystis disease in Centrarchidae. Zoologica, Vol. 30, Part 4, pp. 169-184, illus.

Occurrences among Centrarchids are reported. The course of the infection is described, and the detailed cytology is given in words and illustrations. Experimental infections were effected within a species and between two species of Lepomis. Infection of Lepomis was not transmitted with material from Stizostedion. Illustrations of lesion and infected cells are included.

Weissenberg, Richard

1949. Studies on lymphocystis tumor cells of fish. I. The osmiophilic granules of the cytoplasmic inclusions and their interpretation as elementary bodies of the lymphocystis virus. Cancer Research, Vol. 9, No. 9, pp. 537-542, illus.

Uniformly small granules which show a great affinity for osmic acid stain increased in number with age of the infected cell. They are thought to be infective units of the virus (elementary bodies). Illustrations of infected cell anatomy are included.

Weissenberg, Richard

1951. Studies on lymphocystis tumor cells of fish. II. Granular structures of the inclusion substance as stages of the developmental cycle of the lymphocystis virus. Cancer Research, Vol. 11, No. 8, pp. 608-613, illus.

Primordial granules in inclusion bodies are thought to be vegetative units which multiply by fission and give rise to elementary bodies which are the individual viruses (virus particles). Infected cell anatomy is illustrated.

* Papers marked with asterisks are of special importance to practical fish culturists.

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